Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - 1/2 EXAMINATION - WINTER 2025

Subject Code: BE01000051/BE01R00051 **Date: 24-12-2025**

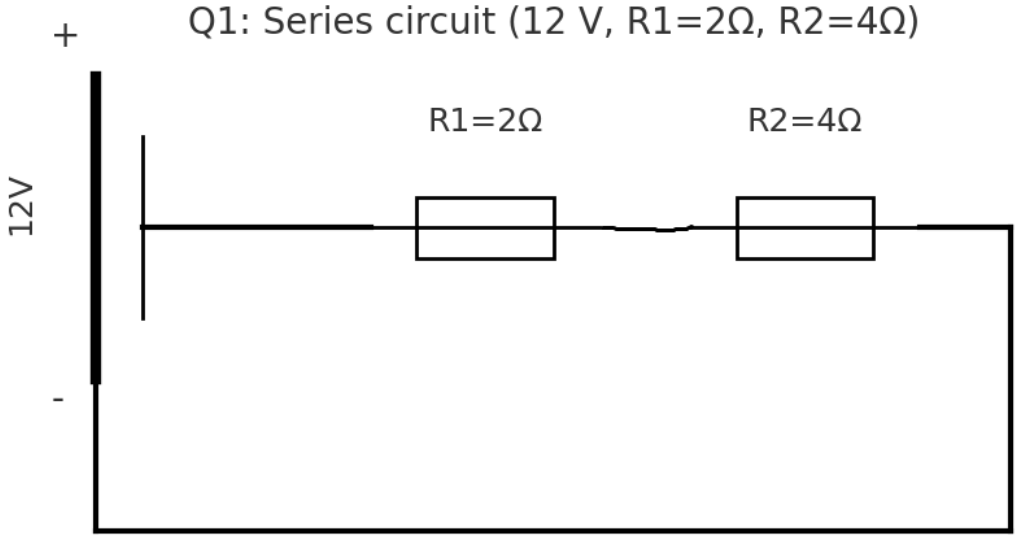
Subject Name: Basic Electrical Engineering

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

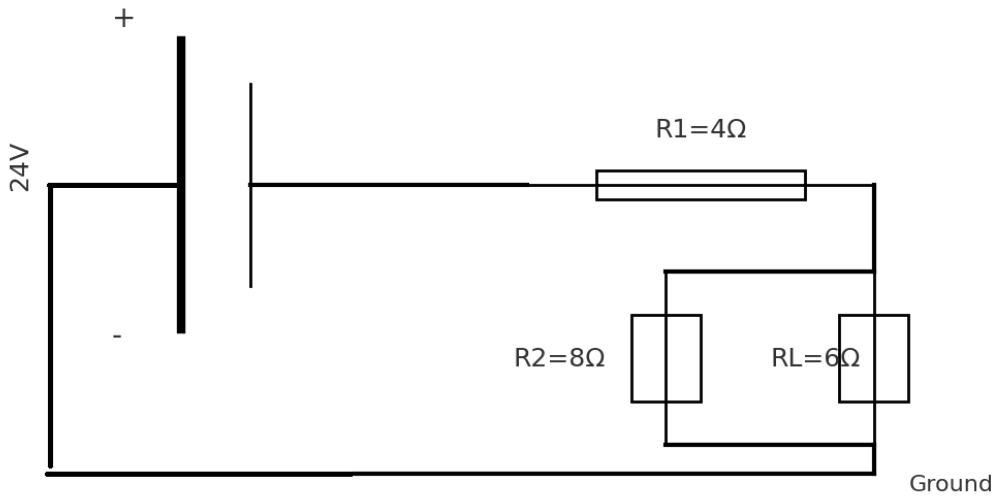
Instructions

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Using Kirchhoff's Voltage Law (KVL), calculate the current flowing through a 2 Ω resistor in a simple series circuit containing a 12 V battery, a 2 Ω resistor, and a 4 Ω resistor.	**03**



(b) For the given circuit, apply Thevenin's Theorem to determine the current flowing through a 6 Ω load resistor connected across two terminals. (Assume: a 24 V source with 4 Ω and 8 Ω resistors in series, load of 6 Ω connected across the 8 Ω resistor terminals.) **04**



(c) A DC circuit consists of three resistors: R1 = 10 Ω, R2 = 20 Ω, and R3 = 30 Ω, connected in a star configuration. Convert this star network into its equivalent delta network, and calculate the resistance values of each branch of the delta. **07**

Q.2 **(a)** Compare the behavior of a pure resistor, a pure inductor, and a pure capacitor when each is connected to a single-phase AC supply. **03**

(b) Analyze and explain why the power factor in an inductive load is always lagging, while in a capacitive load it is leading. **04**

(c) A three-phase system can be connected in either star (Y) or delta (Δ) configuration. Analyze and discuss the differences between these two connections in terms of: **07**

- Line and phase voltages
- Line and phase currents
- Typical applications in electrical systems

OR

(c) Analyze the conditions for series resonance in a single-phase RLC circuit. Discuss how: **07**

- Voltage and current behave at resonance,
- Power factor changes at resonance, and
- Two practical applications of resonance in electrical systems.

Q.3 **(a)** Explain the difference between a magnetic circuit and an electric circuit with one simple example each. **03**

(b) Describe the working principle of a single-phase transformer. Why is it called a "static" electrical machine? **04**

	(c)	Explain the construction and working of a single-phase induction motor. Also, list at least three common household applications where this motor is used.	**07**
		OR	
	(a)	What is hysteresis loss in magnetic materials? Explain why it occurs in transformers.	**03**
	(b)	Describe the term rotating magnetic field. How is it produced in an induction motor?	**04**
	(c)	Explain the working principle of a brushless DC motor (BLDC). Also, mention two advantages of BLDC motors over traditional DC motors.	**07**
Q.4	**(a)**	Explain the difference between MCB (Miniature Circuit Breaker) and ELCB (Earth Leakage Circuit Breaker).	**03**
	(b)	Describe the importance of earthing in domestic wiring systems. Mention two common types of earthing.	**04**
	(c)	Explain the general procedure of preparing an electricity bill for a household. Also, discuss how energy consumption of appliances is calculated in kilowatt-hours (kWh).	**07**
		OR	
	(a)	What are the different types of lamps used in domestic and commercial wiring? Briefly explain any two.	**03**
	(b)	Explain the function of a wattmeter. How is it different from an ammeter and a voltmeter in electrical measurements?	**04**
	(c)	Explain the safety precautions that should be taken while handling household electrical appliances. Support your answer with at least three examples.	**07**
Q.5	**(a)**	State the working principle of a voltmeter.	**03**
	(b)	State the characteristics of a battery.	**04**
	(c)	Write short note on Switch Fuse Unit (SFU)	**07**
		OR	
	(a)	State any three applications of brushless DC (BLDC) motors in daily life.	**03**
	(b)	State different types of batteries and mention one example of each.	**04**
	(c)	Write short note on Earth Leakage Circuit Breaker (ELCB)	**07**

***